

High-Resolution Radar Imaging of Mercury's North Pole with the upgraded Arecibo Radar

M. A. Slade, J. K. Harmon, P. J. Perillat, R. F. Jurgens, and L. J. Harcke

We report here on recent radar observations of Mercury using the upgraded Arecibo telescope at 13-cm to make delay-Doppler images of Mercury's North Polar region. The primary objective of the observations was to obtain more detailed radar images of the planet's bright spots (likely attributable to deposits of cold-trapped volatiles, mainly H₂O ice) in the north polar region. The new 3-km resolution images show fine details in many of the crater features, including concentration of radar-bright deposits in sun-shaded floor areas under crater south rims for more southerly craters. Importantly, more than 30 new features were found. Some of these features we attribute to craters less than 10 km in diameter. All of the new features that are located in the Mariner-10 imaged hemisphere could be identified with known craters. Also, some new features could be seen at relatively low latitudes (72 deg. Lat. to 79 deg. Lat.). The data confirm circular polarization ratio inversion for the radar-bright material in the craters.

We also hope to have analyzed Goldstone observations of Mercury taken in July and August, 1999. These observations are the first use on Mercury at 3.5-cm wavelength of a full-disk imaging technique (the coded-long-pulse) first implemented at Arecibo for observations of Mars (Harmon et al., 1992). (The Arecibo observations above made use of a conventional repeating-code, rather than a coded-long-pulse waveform.) We hope by comparing the radar brightness of the features at 3.5-cm and 13-cm to find if a significant frequency dependence exists, as it does for the Martian residual ice caps, with consequent implications for dust covering and ice thickness.

The NAIC/Arecibo Observatory is operated by Cornell under an agreement with the NSF and with support from NASA. JPL is a division of Caltech; part of this work was performed under contract with NASA's Office of Space Sciences.